Overeducation, Undereducation, and the Theory of Career Mobility

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Abstract

The theory of career mobility (Sicherman and Galor 1990) claims that wage penalties for overeducated workers are compensated by better promotion prospects. Sicherman (1991) was able to confirm this theory in an empirical study. However, the controls for the opposing phenomenon of undereducation used in his tests produced unconvincing results, for which no sound theoretical explanations were given. The only re-test yet conducted (Robst 1995) also produced ambiguous results. In the present paper, we estimate random effects models to analyze relative wage growth using data from the German Socio-Economic Panel. We find that overeducated workers have markedly lower relative wage growth rates than correctly allocated workers, while undereducated workers enjoy higher rates of relative wage growth. Our results cast serious doubt on the career mobility model, at least with respect to the overeducation issue. In view of the acknowledged positive correlation between access to training and upward career mobility, the plausibility of our results is supported by the finding that overeducated workers have less access to formal and informal on-the-job training, while undereducated workers are more likely to be admitted to such programs.

Keywords: qualification mismatch, overeducation, career mobility, wage change

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1 Introduction

A central feature of the theory of career mobility established by Sicherman and Galor (1990) is that "part of the returns to education is in the form of higher probabilities of occupational upgrading, within or across firms." As a consequence, "individuals may choose an entry level in which the direct returns to schooling are lower than those in other feasible entry levels if the effect of schooling on the probability of promotion is higher in this firm."[1] If this were the case, the theory of career mobility would provide a powerful tool for research in overeducation – the phenomenon of a worker's actual level of qualification exceeding the requirements of his or her job (see, e.g., Duncan and Hoffmann 1981). Sicherman's (1991) own empirical tests indeed confirmed the expectation that overeducated workers have better upward career mobility prospects than correctly allocated ones.

As within the career mobility model, overeducation can be regarded as a short-term mismatch occurring at the beginning of a working career. In principle, this would be consistent with almost all empirical findings from various countries, showing that work experience and tenure are negatively correlated with the probability of working in a position for which one is overeducated (see, e.g., Duncan and Hoffmann 1981, Sicherman 1991, Alba-Ramirez 1993, Groot 1996, Kiker et al. 1997, Sloane et al. 1999, Daly et al. 2000). Most authors who perceive their empirical results as being in line with the central findings of Sicherman's study assume the validity of this rather simple construct of the cross-sectional relationship between experience, tenure, and the match between formal qualification and skill requirements (see, e.g., Alba-Ramirez 1993, Groot 1993, Groot 1996, Sloane et al. 1996).

However, the only empirical evidence based on panel data – Sicherman (1991) and Robst (1995) – leaves some questions unanswered. First of all, results seem to be sensitive to the specification and measurement of upward wage mobility. In this respect, it is rather surprising that the career mobility model, based as it is on upward wage mobility, has only been tested using measures of occupational mobility or changes in the level of education required for individuals to perform their jobs across time. In particular, the original occupational measure used by Sicherman (1991) could be problematic, as moving to a better occupation does not necessarily indicate a move to a better job. Second, much of the empirical overeducation literature shows that overeducated workers are generally under-performers with respect to their occupational success up to the date of observation (see, e.g., Tsang and Levin 1985, Tsang et al. 1991, Dolton and Vignoles 1997 and 2000, Mendes de Oliveira et al 2000, Büchel 2001). As such, the idea that overeducated workers should suddenly become out-performers is counter-intuitive. The empirical evidence on this point is also rather ambiguous. On the one hand, Sicherman (1991) and Robst (1995) report that overeducated workers experience more upward occupational mobility and more switches to jobs requiring more training, respectively. On the other hand, Robst (1995) shows that "(…) contrary to the career mobility hypothesis, overeducated workers are not more likely than adequately educated workers to feel their current job provides training which will lead to a better job." (p. 549).

In the light of the fact that the Sicherman (1991) article is now one of the most frequently cited papers in the field of overeducation research, we believe that this rather unsatisfactory pattern of results needs urgent clarification. We therefore retest the career mobility hypothesis on the basis of wage mobility. This is consistent with the career model in which workers temporarily enter jobs for which they are

overeducated in order to obtain the training needed to move on to better, and especially higher-paying, positions.

The paper is structured as follows. First, we discuss the empirical literature on overeducation and its compatibility with the career mobility hypothesis in more detail (Section 2). After presenting data and methods in Section 3, we conduct a thorough re-examination of the results obtained by Sicherman (1991) in Section 4.1. Although we are able to replicate his results with a German dataset, the German Socio-economic Panel, we show that the base effects of upward career mobility have to be modelled carefully to prevent biased estimates. This is followed in Section 4.2 by our major analysis of upward wage mobility. Contrary to the predictions of the career mobility model, we find less upward wage mobility for overeducated workers than for correctly allocated ones, while undereducated workers experience more upward wage mobility. This result holds irrespective of whether the analysis is based on year-to-year changes or five-year mobility. In Section 4.3, we extend Robst's (1995) test for robustness by using an objective, as well as a subjective, measure of training participation. Both measures confirm Robst's findings that overeducated (undereducated) workers indeed receive less (more) training than correctly allocated ones. This finding is consistent with the results gained from our main wage mobility analysis. Finally, in Section 5 we summarize our findings and draw some conclusions.

2 Background

In contrast to all competing theories aiming to explain the persistence of high levels of overeducation in the industrialized countries (e.g., human capital theory, job search theory, assignment theory[2]), the theory of career mobility considers both the supply and the demand side of the labour market. In this theory overeducation is at

times a rational choice for both sides, employees and employers. Understandably, then, overeducation researchers tend to find the career mobility theory put forward by Sicherman (1991) rather attractive. The career mobility model and the empirical test of the model conducted by Sicherman himself have thus had a profound influence on subsequent overeducation research.

However, the theory of career mobility does not provide a completely satisfactory explanation for qualification mismatch in the labour market, as it offers no possible explanation for the opposing and equally observable phenomenon of "undereducation." Nevertheless, Sicherman (1991) enters an undereducation dummy in his models when testing the overeducation hypotheses of the Sicherman and Galor theory. His empirical results show the same significant and positive effect on the probability of promotion for both overeducated and undereducated workers (Sicherman 1991, Table 3, column (c)). Sicherman is himself surprised by this result: "Since the theory of career mobility makes predictions only with respect to overeducated workers, I do not discuss the relations between undereducation and career mobility. So far I do not have a good explanation for this result." (p. 109f.). We are less puzzled by this result than Sicherman. Undereducated workers are generally expected to have above-average abilities (Hartog 2000); compared to the expectations linked to their (relatively low) educational attainments, their career performance up to the point at which the qualification mismatch is observed is atypically successful. Why shouldn't these workers continue to be atypically successful in their future careers?

We are more perturbed by the predictions of the career mobility theory – i.e., that overeducated workers have above-average career prospects. Why should the overeducated, whose previous career paths provide explicit confirmation of the fact that they have been unable to secure a job corresponding to their formal

qualifications, display different behaviour in the future? While we do not dispute that the career mobility model may be able explain some aspects of overeducation, the empirical literature suggests that the career trajectories of overeducated workers in fact take a different course to that predicted by the model.

First of all, previous overeducation research has found that the wage profiles of overeducated, but non-academic, new entrants to the German labour market are flatter in the first career period than those of their correctly allocated counterparts (Büchel 1994). The same was observed for all workers in both East and West Germany after reunification (Büchel 2001). Corresponding findings from other countries are rare, because there is still a lack of longitudinal overeducation research (exceptions being Groot 1996, Dolton and Vignoles 1997). However, Dolton and Vignoles (1997, 2000) and Mendes de Oliveira et al. (2000) have shown that a substantial proportion of the overeducated workforce fails to secure a better job over a longer period of several years. Similar findings have been presented by Battu et al. (1999). All this suggests that careers tend to follow the path laid at labour-market entry, and that overeducated workers do not succeed in achieving extraordinary upward career moves.

Furthermore, several studies have shown that overeducated workers are less productive than correctly allocated workers with the same formal qualifications (see, e.g., Tsang and Levin 1985, Tsang et al. 1991, Büchel 2001)[3]. Whereas the standard approaches in this field usually focus on job satisfaction, health status, absenteeism, firm tenure, and participation in on-the-job-training, the study by Büchel (2001) examined working conditions and behaviour in much more detailed form (with about 50 items). Büchel found indications that overeducated workers are less productive in almost all items. When asked: “Are you willing to work overtime without extra payment?”, overeducated workers were much more likely to give negative answers

than correctly allocated ones. This certainly indicates lower job satisfaction. Moreover, their low levels of on-the-job training mean that overeducated workers are the last to be considered likely candidates for upward mobility by personnel researchers. Of course, one could argue that a lack of satisfaction in a specific job is an important push factor encouraging workers to change firms. The "experience good" variant of the job matching theory (Jovanovic 1979a, 1979b) does indeed predict that the match between educational attainment and qualification requirement will improve over the course of the career. However, recent analyses based on German data have shown that the probability of overeducation increases significantly with the number of previous job changes (Büchel 1998, p. 139). This finding lends support to a labour segmentation approach (Taubman and Wachter, 1986) rather than the job matching theory as an explanation of overeducation. In addition, it is well known that future career opportunities are strongly determined by occupational behaviour in previous jobs; references from former employers would otherwise be pointless. State-dependency could thus also be an important factor in explaining overeducation.

In sum, the empirical literature to date is largely at odds with the career mobility theory and with Sicherman's (1991) findings that overeducated workers experience higher upward occupational mobility. In the following sections, we try to cast some light on the discussion by re-estimating Sicherman's model and examining the wage changes of overeducated and undereducated workers in comparison with their correctly allocated counterparts.

3. Data and Methods

3.1 Database and Case Selection

Our empirical analysis is based on representative longitudinal data from the German Socio-economic Panel (GSOEP), conducted by the German Institute for Economic Research (DIW) in Berlin. This ongoing survey was initiated in 1984, when more than 12,000 individuals aged 16 or above were interviewed. Additional information on these individuals is collected annually with a questionnaire that remains largely constant. The main purpose of the survey is to obtain longitudinal data on educational and labour market behaviour in particular (for more details see Projektgruppe Panel 1995).

In the present study, we use the West German sub-sample from 1984 to 1997. We analyse the year-to-year career mobility of men in full-time employment in various forms. In addition, we extend the approach by considering a five-year observation period. Both analyses require valid information on the variables used to construct the respective mobility measure in each of the years under analysis. In addition, valid information about the covariates in the base year is required.[4] As we also run panel random effect models, those respondents for whom only one pair of income data is available are also excluded. The self-employed, trainees, and civil servants are not included in our sample. To allow for the possibility of upward mobility among all respondents, we exclude those who have already reached the maximum level of the respective position measure in the base year.[5]

3.2 Measuring Over- and Undereducation

A subjective approach is used to identify over- and undereducation. The GSOEP contains yearly information about the formal education of jobholders as well as data on the formal qualifications typically needed to perform their current job. A

comparison of these two variables is usually used to generate the mismatch variable. However, we go one step further and check the plausibility of this mismatch variable by reference to additional information about the blue- or white-collar status of the jobholders. Using this three-variable approach instead of the traditional two-variable one has advantages and disadvantages (for details see Büchel, 2001). The major advantage is that the categorization becomes more precise and the validity of the discrimination between the groups is improved. Following this procedure, two new categories are introduced: implausible combinations of the three variables (< 1%), and a category of cases that cannot be conclusively classified as either mismatch or correct allocation (about 5%). Both of these categories are excluded from our analyses. One minor disadvantage that arises in the three-variable approach is the slightly higher risk of missing values in the mismatch variable. This is not a serious problem, however, because there are almost no missing values for blue- and white-collar status in the GSOEP. Our categorization procedure is documented in Appendix Table A1.

4 Empirical Results

4.1 Replication and Extension of Sicherman's Approach

We follow Sicherman (1991) as closely as possible and use a two-digit coding of occupational groups. This means that a change in the occupation will only be observed when there is an apparent change in the tasks performed. Like Sicherman, we only analyse upward moves. Clearly, this approach requires a ranking of occupational groups. The ranking procedure is based on the mean levels of human capital needed to work in the different occupations. These levels are constructed by first estimating OLS wage regressions including the usual controls for schooling and experience for individual *i* at time *t*:

(1) $\ln(w_{it}) = \alpha_0\, educ_{it} + \alpha_1\, experience_{it} + \alpha_2\, experience_{it}^2 + \alpha_3\, required\ training_{it} + \beta' x_{it} + \varepsilon$

where x_{it} are covariates other than human capital variables. As the GSOEP does not collect information on the 'required training' variable in the form of years, we have to start by estimating this value using data on the years of education acquired by all workers who are correctly allocated, i.e., neither overeducated nor undereducated. The mean level of schooling within the 69 relatively small occupational groups is defined to be the training required to perform the occupation[6]. We then use the parameter estimates for α_0, α_1, α_2, and α_3 (a_0, a_1, a_2, and a_3) to estimate the human capital needed to perform the occupation for each individual i:

(2) $HC_{it} = a_0\, education_{it} + a_1\, experience_{it} + a_2\, experience^2_{it} + a_3\, required\ training_{it}$.

The mean level for each of the 69 occupational groups is then calculated and used to rank the occupation. This procedure provides us with the necessary ranking of occupations.[7] Though not completely identical, there is a close resemblance between our ranking and the one drawn up by Sicherman (see Sicherman 1991, Appendix A, pp. 188f.). The descriptive analysis in the first panel of Table 1 shows that both undereducated and overeducated workers are more likely to move to occupations with higher human capital requirements than the reference group of correctly allocated workers.

---- Please insert Table 1 about here -----

This finding is consistent with the multivariate results produced by Sicherman (1991), reported in the first column of Table 2: the coefficients for both overeducation and undereducation are positive and significant. This implies that respondents in these two groups are more likely than those in the reference group to move to higher-level occupations, with the effect for the undereducated being somewhat higher.

---- Please insert Table 2 about here -----

In order to test whether overeducated workers are more likely to move to higher-ranked occupations in Germany, we now go on to estimate random-effects probit models of the following form:

(3) $$move_{i,(t+1,t)} = \alpha + \gamma_1 over_{i,t} + \gamma_2 under_{i,t} + \beta' x_{i,t} + u_i + \varepsilon_{i,t}$$

where the dummy variable $move_{i,(t+1,t)}$ indicates whether person i moved to an occupation requiring more human capital between t and $t+1$. The dependent variable equals 1 if the worker has moved to a higher-ranked occupation since the previous data collection. Because the highest occupational group cannot achieve further upward mobility, it is excluded from the analyses. The variable $over_{i,t}$ is a dummy indicating overeducation in the base period; $under_{i,t}$ indicates undereducation; $x_{i,t}$ is a set of additional exogenous variables also measured in the base period; u_i is the random disturbance characterizing the i^{th} observation, which is fixed over time; and $\varepsilon_{i,t}$ a white noise error. We introduce random effects to control for individual heterogeneity, i.e., the problem that individuals might not only differ in their observed characteristics, but also in unobserved characteristics over time. Exogenous

variables are those generally known to influence the career-mobility process, such as schooling or experience in the base year.

Replicating Sicherman's multivariate model (Table 2, column I) as closely as possible with our German data, we obtain the same pattern of results for the two dummy variables, as shown in Table 2, column II.[8] We first use a binary logit model, in the same way as Sicherman (column II), and then run a more sophisticated random-effects probit model (column III). At first glance, the results of the overeducation dummy seem to correspond to Sicherman's theory, which assumes that overeducated workers are simply at the beginning of their career, and that their career paths thus intersect with others who have less education and therefore fewer opportunities for upward mobility.

The findings for undereducated workers are difficult to reconcile with those for overeducated workers. While Sicherman (1991, p. 110) has "no good explanation for this result," the findings do correspond with our expectations. While undereducated workers will be given the opportunity for on-the-job training, overeducated workers will have problems in finding better jobs due to the negative signalling effects of their current position or even the depreciation of their human capital. This explanation does not tally with the effects found for overeducated workers, however. We believe that this mixed result is directly related to the measurement of upward career mobility. Before turning to this point in more detail, we demonstrate the effects of including other variables that we consider to be important in a model of career mobility.

A major conclusion of the career mobility theory proposed by Sicherman and Galor (1990) is that firm tenure impacts on the probability of moving between or within firms. It is thus rather strange that Sicherman did not control for this strategic variable in his own model. Similarly, firm size and industry are known to affect

career opportunities. The respective dummy variables for Germany were therefore included in Table 2, column IV, with no notable effects on the over- and undereducation results.

However, another, even more important influence also has to be taken into consideration. A closer examination of the occupations reveals that mobility between some of the groups is almost impossible. In the highest groups primarily occupied by academics (2-8), only about 2% of respondents realized upward moves,[9] with most of these moves being made into the very broad category including architects, chemists, engineers, physical and biological scientists, and mathematicians. Moving down the ladder of occupations, upward moves become increasingly plausible: nearly 10% of respondents in the lowest groups (25-27) accomplished upward moves. This phenomenon also has to be taken into account in the analyses; we thus propose to include controls for the starting position in the occupational hierarchy. In order to control for this "base effect," we form five groups and include four dummy variables in the third specification for Germany (Table 2, Model V).[10] All of these dummies have negative signs and are highly significant: As expected, workers in higher occupational groups are less likely to move upward than workers in the lowest occupations. Once these base effects have been included, overeducation becomes insignificant, showing that the base effect indeed explains much of the variance otherwise picked up by the overeducation variable, since overeducation is most likely in jobs with low skill requirements.[11] Moreover, the schooling coefficient – which was negative in Sicherman's analysis and was insignificant for Germany in the first three specifications – now becomes positive, as was initially expected. In other words, controlling for the base effects leads to more plausible results in terms of the theory formulated by Sicherman and Galor: Education has a positive influence

on the probability of being promoted. In the following sections, we explore whether the results hold when other measures of upward career mobility are applied.

4.2 Results of the Upward Wage Mobility Approach

In response to these results, we propose an alternative, improved measure of career mobility. Such a measure is provided by Sicherman and Galor's model itself, which is based on the proposition that upward career mobility is associated with wage increases. In the following, we thus look directly at wage increases.

In the GSOEP, workers report gross monthly wages for their current job on a yearly basis. We use this information to construct two measures of upward wage mobility as an indicator for an upward career move. To allow for the possibility of upward mobility among all individuals in our sample, the highest earners with gross monthly earnings of above DM 10,000 in the base year were excluded from the analyses. In our first specification (equation 4) workers (i) are defined to experience upward career mobility if their wage growth from year t to $t+1$ (or to $t+5$ respectively) is higher than the mean wage growth during that period plus one standard deviation in their status group (g) in the pair of years under investigation (y)[12]:

$$\Delta \ln (w_{i,y}) > \text{mean} (\Delta \ln (w_{g,y})) + \text{std} (\Delta \ln (w_{g,y})). \quad (4)$$

This approach was chosen to allow for career moves in the sense of Sicherman and Galor to be identified. In our second specification, we take a continuous, rather than binary, dependent variable. We estimate wage growth regressions using the same set of covariates (x_{it}) as in the previous analyses, but now using GLS with random effects:

$$(5) \qquad \ln w_{i,t+x} - \ln w_{i,t} = \alpha + \gamma_1 over_{i,t} + \gamma_2 under_{i,t} + \beta x_{i,t} + u_i + \varepsilon_{i,t} \text{ ; x = 1; 5.}$$

Wage growth regressions similar to this have frequently been used to study, for example, the effects of job mobility and reasons for job change on wages (see, e.g., Bartel and Borjas 1981, Addison and Portugal 1989, Ruhm 1987, Neal 1995, and Burda and Mertens 2001). We estimate two different specifications, the first analysing wage changes from the year of observation *t* to the subsequent year *t+1,* and the second analysing changes from year *t* to *t+5*. Note that covariates are always measured in the base period *t*.

The descriptive statistics of the wage change analysis are reported in the second panel of Table 1 above. Whereas the descriptive results are very similar to those found in the replication of Sicherman's occupational upward mobility approach (first panel in Table 1), the results produced by the models in Table 3 are rather different from those presented in Table 2. Based on the results of the previous analyses, we include the base income in our model, thus controlling for the important effect that people starting from a lower level always have better opportunities for career advancement.

---- Please insert Table 3 about here ----

No matter which specification we use, the signs of the coefficients for the overeducation variables turn from plus to minus (Table 3). Note that we now control for the base effect. Overeducated workers are less likely to experience above-average relative wage increases than correctly allocated workers; undereducated workers are more likely to experience such increases. Even if we believed that overeducated

workers are more likely to move up or between occupations, what matters most is whether their wages increase accordingly. There is no doubt at all that a valid indicator for upward career mobility should display a high positive correlation with relative wage growth. If overeducated workers are expected to have better career opportunities than correctly allocated workers, higher rates of wage growth should also be observed among this group. This does not seem to be the case, however. The structure of results holds when switching form a one-year to a five-year observation period (Table 4).

---- Please insert Table 4 about here ----

The results presented in this section suggest that Sicherman's (1991) empirical test is not an appropriate test for his theory. This casts serious doubt on Sicherman and Galor's (1990) hypothesis that overeducation is associated with better career prospects.

These results correspond to other findings from overeducation research, as outlined in the Section 2. Overeducation can, for example, be explained by simple structural discrepancies in the relative supply and demand of qualified workers: An oversupply in highly qualified workers might result in overeducated workers being stuck in lower-level jobs due to the depreciation of their human capital, de-motivation, or negative signalling (Spence 1973), for example. Undereducated workers, on the other hand, might benefit from the fact that some firms are looking for qualified workers but are not able to hire workers with the appropriate level of education. Another explanation can be found in human capital theory, and has also been proposed by Sicherman (1991). When human capital differs in measurable (on-the-job training, experience) as well as non-measurable (ability) components, it will

always be possible to find workers who are not allocated according to their measurable educational attainment. In the following and final section, we test whether subjective and objective information about on-the-job training provides support for our results and interpretations.

4.3 Testing for Robustness: Access to On-the-Job Training

Finally, we test the results obtained in the previous step for robustness, analysing on-the-job training activities for under- and overeducated workers. This is done using two indicators, a subjective and an objective one. First, we use the respondents' answers to the question: "Do you feel that, when doing your job, you are always learning things that could lead to a better job or promotion?" (response alternatives: "absolutely correct," "partly correct," "not correct"). This question was posed in the GSOEP in the years 1985, 1987, 1989, and 1997. Robst (1995) used the same question and concluded for the United States that, contrary to the career mobility hypothesis, overeducated workers are no more likely to acquire knowledge that could lead to a better job. Second, we use information gathered in the years 1989 and 1993 on whether GSOEP respondents had participated in a job-related training measure lasting more than one day in the preceding three-year period ("yes" or "no").

It could be the case that firms hire undereducated workers when they are not able to find better qualified workers, and that overeducated workers take these jobs because there are simply not enough positions available for people of their qualification level. In this case, we can expect to find that overeducated workers are less likely to learn things that could further their career advancement, or to receive formal on-the-job training. The GSOEP contains information on both variables. Table 5 presents some basic descriptives.

---- Please insert Table 5 about here ----

In Table 5, we find very strong correlations between formal and informal training on the one hand and mismatch status on the other. Overeducated workers have far fewer opportunities to learn things that they consider to be useful for their future career,[13] and have far less access to on-the-job training measures than correctly allocated workers. For undereducated workers, the reverse is the case. These results hold when controlling for several socio-economic characteristics (Table 6, Models I and III) as well as for job characteristics (Models II and IV).

---- Please insert Table 6 about here ----

Some authors, such as Hersch (1995), argue that the finding that overeducated workers receive less training than correctly allocated ones is in line with theoretical expectations, and contend that the overeducated simply need less initial training to perform their job on account of their higher productivity. However, this contradicts the unchallenged empirical evidence that on-the-job training is a complementary, rather than a substitutive, element of human capital. This means that employers tend to select the most productive workers for training measures; a selection mechanism that was observed by Gerlach and Jirjahn (1998), for example, in analyses of firm data. Since overeducated workers are less productive, it is not surprising that they report less access to training opportunities than correctly allocated workers. On the contrary, this result is to be expected.

5. Conclusions

The central finding of the present analysis is that overeducated workers have worse career prospects than correctly allocated workers. This is in clear contrast to the results put forward by Sicherman (1991). Note, however, that we were able to replicate the US results with our German data when using Sicherman's approach. Therefore, the key to understanding the puzzling pattern of results is to be found in a discussion of the validity of the indicators chosen to indicate upward career mobility, and the quality of specification in Sicherman's model.

In this respect, we believe that a move from an occupation with low demands in terms of human capital investment to one with higher requirements is not a satisfying indicator for upward mobility. First of all, this would not cover the majority of career moves, which are to be observed within specific professions. This holds especially when aggregating occupations within large groups, as done by Sicherman. How often will it be possible to observe a move from Sicherman's category of "judges, lawyers" (ranking position 2) to that of "physicians, dentists" (ranking position 1)?

For West Germany, we found that most changes are realized between groups with low human capital stock. It is essential to control for the fact that most mobility occurs in the lower categories. Failing to control for this base effect will lead to severe misinterpretation of the findings, as our results show. The problems with categorization of groups disappear when using the metric scaled variable "relative wage change"; the problem with ceiling effects at the upper end of distribution remains. It is trivial to state that promotion is easier to realize when starting from a lower point in the hierarchy (where most of the overeducated are to be found) than from a higher one. However, this is not the question to be analysed: The question is whether qualification mismatch per se has an impact on career prospects. It is thus

essential to control for the starting situation in these model types, regardless of the construction of the dependent variable indicating upward career mobility.

The first overall conclusion to be drawn from our findings is that moves between occupations with different human capital requirements are not very valid indicators for career mobility in a vertical sense. Relative wage change is a better indicator, producing much more plausible results. Second, when analysing upward mobility, it is important to control for the starting position. If this step is omitted, results tend to be influenced by the simple ceiling effect that people starting from a very low position have better chances of upward mobility than those with a higher position. This effect has nothing to do with qualification mismatches. Because overeducated (undereducated) workers tend to have jobs with lower (higher) requirements than correctly allocated workers, this ceiling effect is at least partly attributable to the mismatch covariates. Therefore, results can be seriously misleading if these effects are not controlled for. Only when using wage growth as an indicator for upward career mobility and controlling for starting wages do we find what we really expect: Less successful people who work in jobs for which they are overeducated continue to be less successful in their careers than correctly allocated workers, while the opposite is true of undereducated persons.

With respect to the overeducated, these findings are in line with the findings of Büchel and Pollmann-Schult (2001), who have shown that overeducated workers have significantly lower school achievements than correctly allocated workers with the same level of formal qualification. This is, by the way, an alternative explanation for the occurrence of overeducation that is conceded by Sicherman himself (1991, p. 103). Viewed in this light, overeducated workers lack necessary skills that cannot be substituted by the signalling effect of their certificates. Compared with other job applicants with the same level of formal qualification, they are allocated to a lower

position in Thurow's (1975) job queue. At first glance and relative to other workers, these overeducated workers with low skills show similar characteristics as the overeducated job-starters in the career mobility model: less work experience (because of a higher unemployment risk) and lower levels of firm tenure (because they tend to work in peripheral labour markets with instable jobs). The simple attribution of these characteristics to overeducation therefore cannot be taken as proof of the explanatory power of the career mobility theory in the context of overeducation. On the contrary, our overall results indicate that the career mobility model, though theoretically and intuitively intriguing, cannot explain the widespread persistence of overeducation in industrialized countries.

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Tables

Table 1 **Overeducation, Undereducation, and Upward Mobility in West Germany**
Descriptive Statistics

		Correctly allocated	Overeducated	Undereducated	*(All)*
A)					
Move to higher-ranked occupation[a]	**No**	15989 (96.3%)	2532 (95.5%)	393 (94.0%)	*18914 (96.2%)*
	Yes	610 (3.7%)	119 (4.5%)	25 (6.0%)	*754 (3.8%)*
		16599 (100%)	*2651 (100%)*	*418 (100%)*	*19668 (100%)*
B)					
1-Year Wage growth > (mean + standard deviation)[b]	**No**	14154 (89.1%)	2277 (88.3%)	324 (85.4%)	*16755 (89.0%)*
	Yes	1746 (10.9%)	300 (11.7%)	60 (14.6%)	*2106 (11.0%)*
		15900 (100%)	*2577 (100%)*	*384 (100%)*	*18861 (100%)*

Note: Frequencies are calculated for each column.

[a] Only workers with valid data for the occupation variable in two consecutive years are included. The highest occupational group in the base year was excluded because, by definition, this group cannot achieve further upward mobility.

[b] Only workers with valid data for the wage variable in two consecutive years are included. Extreme values were excluded (below DM 1,000 per month and above DM 15,000 per month gross earnings). To allow for the possibility of upward mobility among all respondents, those with wages above DM 10,000 per month in the base period were also excluded. Means and standard deviations are calculated separately for blue- and white-collar workers by year.

The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.

Source: Own calculations based on data from the 1984-1997 waves of the German Socio-Economic Panel (GSOEP).

Table 2 Overeducation, Undereducation and Upward Occupational Mobility
Dependent variable = 1 if moved to a higher-ranked occupation

	United States (Sicherman 1991)	West Germany			
	I[a]	II[a]	III[b]	IV[b,c]	V[b,c]
Intercept	-0.3157 (-1.2)	-2.3713** (0.2617)	-1.3856** (0.1173)	-1.9171** (0.1528)	-2.2226** (0.1934)
Schooling	-0.0676** (-4.2)	-0.0031 (0.0179)	-0.0008 (0.0080)	0.0015 (0.0083)	0.0835** (0.0128)
Experience	-0.0536** (-3.8)	-0.0614** (0.0167)	-0.0284** (0.0075)	-0.0255** (0.0083)	-0.0303** (0.0096)
Experience^2	0.0000 (1.6)	0.0010** (0.0004)	0.0005** (0.0002)	0.0004* (0.0002)	0.0005** (0.0002)
Union member	0.2050 (2.4)	-0.0805 (0.0838)	-0.0339 (0.0369)	-0.0412 (0.0389)	-0.0642 (0.0450)
Foreigner	0.1076 (1.2)	-0.0677 (0.0851)	-0.0313 (0.0379)	-0.0316 (0.0396)	-0.1240* (0.0491)
Large city	-0.0949 (-1.1)	0.0034 (0.0807)	0.0013 (0.0359)	0.0134 (0.0372)	-0.0021 (0.0441)
Married	-0.1631 (-1.5)	-0.0558 (0.0954)	-0.0234 (0.0429)	-0.0235 (0.0445)	-0.0204 (0.0513)
Disabled	-0.1091 (-0.67)	-0.4445** (0.1370)	-0.1918** (0.0578)	-0.3172** (0.0593)	-0.3661** (0.0660)
Overeducated	0.2181* (2.5)	0.2315* (0.1038)	0.0978* (0.0471)	0.1173* (0.0491)	-0.0900 (0.0600)
Undereducated	0.3103** (2.6)	0.5332* (0.2117)	0.2460* (0.0999)	0.2406* (0.1043)	0.5669** (0.1282)
Occupations ranked 2-8	.	.	.	.	-1.6352** (0.1270)
Occupations ranked 9-13	.	.	.	.	-0.6388** (0.0820)
Occupations ranked 14-18	.	.	.	.	-0.6950** (0.0860)
Occupations ranked 19-24	.	.	.	.	-0.7359** (0.0593)
Base group: ranks 25-27	.	.	.	.	
Tenure, firm size, and industry dummies	NO	NO	NO	YES	YES
LR or Wald Chi^2	.	62.48**	62.41**	326.43**	456.04**
Observations	5064	19668			
Groups	.	2931			

Note: ** indicates significance at the 1% level and * at the 5% level. All regressors are measured in the base period. [a] Logit regressions; asymptotic t-statistics in parentheses. Upward moves between 1976-1977 and 1978-1979. [b] Random effects probits; standard errors in parentheses. The highest occupational group in the base year was excluded because its members cannot achieve further upward mobility. [c] Tenure, firm size, and industry dummies included and not reported.

The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.

Source: [a] PSID: Sicherman (1991), Table 3, column (c). [b] Own calculations based on data from waves 1984-1997 of the German Socio-Economic Panel (GSOEP).

Table 3 Overeducation, Undereducation and One-Year Upward Wage Mobility

	West Germany			
	Dependent variable = 1 if wage growth > mean+stand. deviation[a]		Dependent variable = wage growth[b]	
	I	**II** [c]	**III**	**IV** [c]
Intercept	-0.9127**	-0.8596**	0.0655**	0.0641**
	(0.1073)	(0.1228)	(0.0090)	(0.0105)
Schooling	0.0733**	0.0747**	0.0124**	0.0124**
	(0.0087)	(0.0088)	(0.0007)	(0.0007)
Experience	-0.0094	-0.0004	-0.0017**	-0.0008
	(0.0065)	(0.0069)	(0.0006)	(0.0006)
Experience^2/10	0.001	-0.0001	0.0003**	0.0000
	(0.001)	(0.0001)	(0.0001)	(0.0000)
Union member	0.0372	0.0491	0.0054*	0.0051*
	(0.0310)	(0.0315)	(0.0026)	(0.0026)
Foreigner	-0.0083	-0.0126	-0.0142**	-0.0139**
	(0.0332)	(0.0335)	(0.0028)	(0.0028)
Large city	0.0127	0.0097	-0.0002	-0.0005
	(0.0313)	(0.0314)	(0.0026)	(0.0026)
Married	0.0203	0.0205	0.0101**	0.0101**
	(0.0366)	(0.0366)	(0.0031)	(0.0031)
Disabled	-0.1038*	-0.1090**	-0.0040	-0.0056
	(0.0413)	(0.0422)	(0.0035)	(0.0036)
Overeducated	-0.1440**	-0.1591**	-0.0253**	-0.0271**
	(0.0426)	(0.0429)	(0.0036)	(0.0036)
Undereducated	0.5099**	0.5006**	0.0458**	0.0453**
	(0.0949)	(0.0951)	(0.0085)	(0.0085)
Base year wage (gross monthly)/1000	-0.2762**	-0.2859**	-0.0352**	0.0366**
	(0.0157)	(0.0160)	(0.0010)	(0.0010)
Tenure, firm size, and industry dummies	NO	YES	NO	YES
Chi^2 / F	Chi^2=442.13**	Chi^2=476.42**	Chi^2=1375**	Chi^2=1467.13**
Observations	18861		18861	
Groups	2974		2974	

Note: ** indicates significance at the 1% level and * at the 5% level. All regressors are measured in the base period. Random effects probits; standard errors in parentheses. Extreme values were excluded (below DM 1,000 per month and above DM 15,000 per month). To allow for the possibility of upward mobility among all respondents, those with wages above DM 10,000 per month in the base period were also excluded. Means and standard deviations of wage change are calculated separately for blue- and white-collar workers by year.

[a] Random effects probit; dependent variable=1 if: $\Delta \ln (w_i,g,y) > \text{mean} (\Delta \ln (wg,y)) + \text{std} (\Delta \ln (wg,y))$, where I = individuals, g = seven occupational position groups and y = pair of years.

[b] Random effects GLS; dependent variable is wage growth: $\ln(w_{t+1}) - \ln(w_t)$.

[c] Tenure, firm size, and industry dummies included and not reported.

The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.

Source: Own calculations based on data from the 1984-1997 waves of the German Socio-Economic Panel (GSOEP).

Table 4 Overeducation, Undereducation and Five-Year Upward Wage Mobility

	West Germany			
	Dependent variable = 1 if wage growth > mean+stand. deviation[a]		Dependent variable = wage growth[b]	
	I	**II[c]**	**III**	**IV[c]**
Intercept	-0.5313*	-0.3875	0.2091**	0.2155**
	(0.2425)	(0.2665)	(0.0241)	(0.0255)
Schooling	0.1784**	0.1768**	0.0452**	0.0445**
	(0.0207)	(0.0210)	(0.0019)	(0.0019)
Experience	-0.0434**	-0.0392*	-0.0016	-0.0012
	(0.0151)	(0.0161)	(0.0013)	(0.0014)
Experience^2/10	0.0005	0.0003	0.0001*	0.0000
	(0.0003)	(0.0004)	(0.0000)	(0.0000)
Union member	0.0291	0.0371	0.0158**	0.0142**
	(0.0644)	(0.0660)	(0.0053)	(0.0054)
Foreigner	-0.1680*	-0.1484	-0.0557**	-0.0509**
	(0.0775)	(0.0787)	(0.0078)	(0.0079)
Large city	0.0574	0.0560	0.0024	0.0021
	(0.0712)	(0.0719)	(0.0070)	(0.0070)
Married	-0.0115	-0.0045	-0.0029	-0.0022
	(0.0748)	(0.0756)	(0.0069)	(0.0069)
Disabled	-0.0696	-0.0900	0.0254**	0.0193**
	(0.0640)	(0.0665)	(0.0048)	(0.0050)
Overeducated	-0.2245**	-0.2185*	-0.0448**	-0.0442**
	(0.0875)	(0.0887)	(0.0080)	(0.0080)
Undereducated	0.7286**	0.7294**	0.1311**	0.1309**
	(0.2226)	(0.2247)	(0.0197)	(0.0197)
Base year wage (gross monthly)/1000	-0.0007**	-0.0007**	-0.0001**	-0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Tenure, firm size and industry dummies	NO	YES	NO	YES
Chi^2 / F	Chi^2=474.19**	Chi^2=478.63**	Chi^2=3517.43**	Chi^2=3591.69**
Observations	9689		9689	
Groups	1924		1924	

Note: ** indicates significance at the 1% level and * at the 5% level. All regressors are measured in the base period. Random effects probits; standard errors in parentheses. Extreme values were excluded (below DM 1,000 per month and above DM 15,000 per month). To allow for the possibility of upward mobility among all workers, those with wages above DM 10,000 per month in the base period were also excluded. Mean and standard deviation of wage change are calculated separately for blue- and white-collar workers by year.

[a] Random effects probit; dependent variable=1 if: $\Delta \ln (w_i,g,y) > \text{mean} (\Delta \ln (wg,y)) + \text{std} (\Delta \ln (wg,y))$, where I = individuals, g = seven occupational position groups and y = five-year interval.

[b] Random effects GLS; dependent variable is wage growth: $\ln(w_{t+5}) - \ln(w_t)$.

[c] Tenure, firm size, and industry dummies included and not reported.

The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.

Source: Own calculations based on data from the 1984-1997 waves of the German Socio-Economic Panel (GSOEP).

Table 5 Learning On-the-Job and Formal Training: Tests for Robustness (Descriptive Statistics)

		Correctly Allocated	Overeducated	Undereducated	*(All)*
Do you feel that, when doing your job, you are always learning things that could lead to a better job or promotion?[a]	**No/ partly**	3733 (82.06%)	752 (16.53%)	64 (1.41%)	*4549 (70.10%)*
	Yes	1732 (31.69)	137 (15.41)	71 (52.59)	*1940 (29.90%)*
		5465 (100%)	*889 (100%)*	*135 (100%)*	*6489 (100%)*
Have you participated in any vocational training during the past three years?[b]	**No/ partly**	1759 (80.10%)	334 (92.78%)	28 (51.85%)	*2121 (81.26%)*
	Yes	437 (19.90%)	26 (7.22%)	26 (48.15%)	*489 (18.74%)*
		2196 (100%)	*360 (100%)*	*54 (100%)*	*2610 (100%)*

Note: Frequencies are calculated for each column and are weighted by the sample weight.
[a] Years: 1985, 1987, 1989, 1997.
[b] Years: 1989, 1993; only training lasting more than one day is considered in the "yes" category.
The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.
Source: Own calculations based on data from the 1984-1997 waves of the German Socio-Economic Panel (GSOEP).

Table 6 Learning On-the-Job and Formal Training: Tests for Robustness (Results from Models)

	West Germany			
	Dependent variable=1 if worker feels that he is always learning things on the job that are helpful for further promotion		Dependent variable=1 if worker received at least two days of formal training over the past three years	
	I[a]	II[a,c]	III[b]	IV[b,c]
Intercept	-1.6566**	-1.9852**	-3.3174**	-2.8683**
	(0.2010)	(0.2490)	(0.3843)	(0.4261)
Schooling	0.1422**	0.1453**	0.1990**	0.1650**
	(0.0144)	(0.0145)	(0.0234)	(0.0234)
Experience	-0.0276*	-0.0174	0.0268	0.0361
	(0.0117)	(0.0124)	(0.0238)	(0.0252)
Experience^2	0.0002	0.0001	-0.0011*	-0.0014**
	(0.0002)	(0.0003)	(0.0005)	(0.0005)
Union member	-0.0272	0.0119	0.0850	-0.0386
	(0.0558)	(0.0569)	(0.1010)	(0.1061)
Foreigner	-0.4866**	-0.4854**	-1.3186**	-1.2622**
	(0.0658)	(0.0665)	(0.1498)	(0.1498)
Large city	0.0701	0.0611	0.2683**	0.2467*
	(0.0596)	(0.0598)	(0.1009)	(0.1016)
Married	0.1004	0.1032	0.2237+	0.2529*
	(0.0689)	(0.0692)	(0.1254)	(0.1257)
Disabled	-0.0204	-0.0435	-0.1085	-0.0882
	(0.0440)	(0.0484)	(0.2075)	(0.2082)
Overeducated	-0.7152**	-0.7260**	-0.7988**	-0.8356**
	(0.0839)	(0.0842)	(0.1681)	(0.1690)
Undereducated	0.4741**	0.4981**	0.8912**	0.8041**
	(0.1570)	(0.1577)	(0.2628)	(0.2600)
Tenure, firm size, and industry dummies	NO	YES	NO	YES
Chi^2	345.16**	387.41**	192.17**	206.59**
Observations	6489		2610	
Groups	2238		1305	

Note: Random effects probits; standard errors in parentheses: ** indicates significance at the 1% level, * at the 5% level and + at the 10% level.
a Pooled waves 1985, 1987, 1989, 1997 of GSOEP.
b Pooled waves 1989, 1993 of GSOEP.
[c] Tenure, firm size, and industry dummies included and not reported.
The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.
Source: Own calculations based on data from the German Socio-Economic Panel (GSOEP).

Appendix Tables

Table A1 Categorization of Over- and Undereducation

Job Requirements	Occupational Position of Jobholder	Formal Qualification of Jobholder		
		No Degree	Vocational Training Degree	Academic Degree
		Mismatch Status		
No Training or Just Short Introduction to the New Job Required	Unskilled or Semi-Skilled Blue Collar	correct	over	over
	Skilled Blue Collar	-	?	-
	Unskilled White Collar	correct	over	over
	Skilled White Collar	-	?	?
	Professional or Managerial White Collar	-	-	-
Longer Firm-Specific Settling-In Period Required	Unskilled or Semi-Skilled Blue Collar	correct	over	over
	Skilled Blue Collar	correct	?	-
	Unskilled White Collar	correct	over	over
	Skilled White Collar	under	?	?
	Professional or Managerial White Collar	under	?	?
Vocational Training Degree or Special Courses Required	Unskilled or Semi-Skilled Blue Collar	correct	?	over
	Skilled Blue Collar	correct	correct	over
	Unskilled White Collar	correct	correct	over
	Skilled White Collar	under	correct	over
	Professional or Managerial White Collar	under	correct	correct
Academic Degree Required	Unskilled or Semi-Skilled Blue Collar	-	-	-
	Skilled Blue Collar	-	-	-
	Unskilled White Collar	-	-	-
	Skilled White Collar	-	-	?
	Professional or Managerial White Collar	under	under	correct

Legend:
correct: Correctly allocated
over: Overeducated
under: Undereducated
?: Unclear mismatch status (about 5%)
-: Implausible combination of mismatch-generating variables (< 1%)

Note: System applies to West Germany only. The self-employed and civil servants are excluded.
Source: Own extension of the Büchel and Weißhuhn (1997) concept.

Table A2 Means and Frequencies for All Specifications

	Move to Higher-Ranked Occupation	**Upward Wage Mobility**
Continuous variables:		
Means (standard deviations)		
Schooling in years	10.9 (2.3)	10.9 (2.2)
Experience in years	22.3 (10.6)	22.1(10.6)
Dependent variable	.	0.04 (0.16) [a]
Dummy variables:		
Frequencies		
Dependent variable	3.8	11.2 [b]
Union	31.8	32.0
Non-German	35.1	35.5
City	32.3	32.7
Spouse	75.9	75.2
Disabled	12.2	12.3
Overeducated	13.5	13.7
Undereducated	2.1	2.0
Tenure ≤ 1 year	7.3	7.5
1 < tenure ≤ 5 years	22.0	21.0
5 < tenure ≤ 10 years	20.9	22.4
10 < tenure ≤ 20 years	31.1	30.7
Tenure > 20 years	18.7	18.4
Firm size < 20	7.7	13.3
20 < Firm size ≤ 200	12.5	12.2
Firm size > 200	25.9	20.5
Firm size missing	53.9	54.0
Agriculture, forestry, and fisheries	0.4	0.3
Energy and mining	1.3	1.1
Manufacturing	22.4	22.5
Construction	5.8	5.4
Trade	2.6	2.8
Traffic and communication	2.1	2.1
Credit and insurance	1.3	1.3
Other services	2.9	2.9
State and social security	1.9	1.9
Non-profit	0.4	0.4
Industry missing	48.9	48.8

Note: [a] Models III and IV in Table 4. [b] Models I and II in Table 4.

The sample includes male workers who were below the age of 65 in 1997. Only West Germans and foreigners who were educated and trained in West Germany are included. Only full-time blue- and white-collar workers. The self-employed, trainees, and civil servants are not included.

Source: Own calculations based on data from the 1984-1997 waves of the German Socio-Economic Panel (GSOEP).

Endnotes:

[1] See Sicherman and Galor (1990), pages 169 and 177.
[2] For an overview of these and many more, see Rumberger (1981) or Büchel (2001).
[3] Note, however, the contrasting findings when comparing persons working in jobs with similar requirements rather than persons with similar formal qualifications (Büchel forthcoming).
[4] Information on disability was not collected in the 1990 or 1993 waves of the GSOEP. Union status was only surveyed in years 1985, 1989, 1989, and 1993. We thus use data from the last available year for both of these variables. This should not cause major problems as both variables show only minor variation over time.
[5] In the earnings analysis, we exclude persons with gross monthly earnings of above DM 10,000 in the base year. A very few outliers with earnings below DM 1,000 or above DM 15,000 in any year of observation are also excluded.
[6] A list of covariates and results of this preliminary step are available from the authors on request.
[7] Because this data was collected using the ISCO in the GSOEP, some groups are not directly comparable to Sicherman's groups, e.g., the group "other craftsmen" is split up into several groups in Germany. Moreover, the group "public advisor" does not exist in Germany and self-employed workers are not included in the analyses. Results of this step are available from the authors on request.
[8] See Appendix Table A2 for on overview of the means and frequencies of all variables included in the analysis.
[9] Upward move frequencies are not reported in the tables.
[10] This is similar to the approach taken by Robst (1995), who found that controlling for required schooling leads to insignificant parameter estimates of the overeducation variable.
[11] The 1995 data for West Germany, for example, show that 89% of all overeducated respondents work in jobs that require no skills at all (Büchel forthcoming).
[12] The groups follow workers' status position as described in the previous section, with the exception that managerial and professional white-collar workers were aggregated into a single group on account of the relatively small number of observations per year. For each of the 91 groups, the means and standard deviations of wage growth were then estimated per year.
[13] This result is in line with that reported by Robst (1995: Table 6, column 1).